Space Transportation System
Stack Assembly

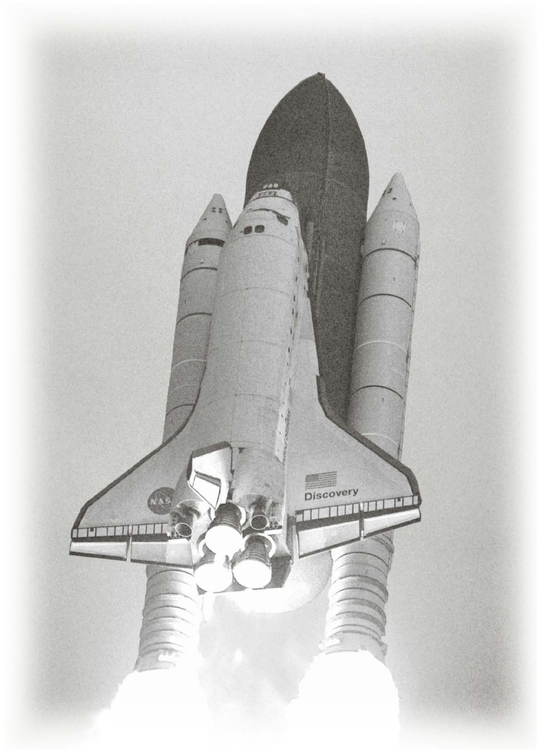


Image Caption and Credit

THIS TEXT IS A SAMPLE TEXT, IT WAS COPIED VERBATIM FROM JOS HAYMAN's "SPACE SHUTTLE PROGRAMME" AS A PLACE HOLDER!

Development of the Space Shuttle commenced in 1969 and a contract for the construction of the Space Shuttle was awarded in July 1972. The vehicle consisted basically of the orbiter vehicle, built by North American Rockwell (later Boeing), two solid fuelled booster rockets built by Thiokol (later ATK Launch Systems) and an external tank built by Martin Marietta (later Lockheed Martin). Of these only the external tank was not re-usable.

The orbiter was propelled by three Rocketdyne liquid fuelled motors which gave a thrust of 2,100,000 N during the launch. The fuel was stored in the external tank, which was jettisoned after launch. The orbiter had a length of 37.25 m and a span of 23.79 m, whilst the external tank had a length of 47.00 m and a diameter of 8.38 m. The early Standard Weight Tanks (SWT) had a mass of 35,000 km and they were superseded by the Light Weight Tank (LWT) of 30,000 kg and the Super Light Weight Tanks (SLWT) of 26,500 kg. The payload bay had a length of 18.29 m and a width of 4.57 m and allowed, typically, three satellites to be stored. Payload capability was 24,000 kg. The two solid fuelled boosters had been developed by Thiokol, used polybutadiene and developed a thrust 23,572,400 N. They had a length of 45.47 m and a diameter of 3.78 m. After separation from the orbiter, immediately after launch, these boosters returned to Earth suspended from parachutes and were recovered from the ocean surface.

The orbiter provided accommodation to up to seven astronauts, four of which were seated on the flight deck during the launch whilst another three were seated in the mid-deck area below the flight deck. This mid-deck area also housed bunks for the astronauts, the galley and the washroom. This area was also used for the storage of certain experiments.

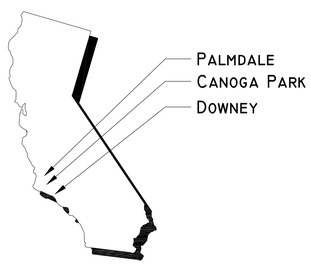
The payload bay was fitted with the Canadian built remote manipulator system, consisting of two 'arms' of 6.7 m length each, joined by means of a flexible joint and with a grappling hook and television camera at the end. The system was controlled from the mid-deck control station. Once in orbit, the payload bay doors were opened as they contained the radiators of the orbiters cooling system. Although the orbiter had three main engines these could not be used after separation from the external tank. In orbit maneuvers were performed with two orbital maneuvering engines which used monomethylhydrazine and nitrogen peroxide. In addition there was an attitude control system consisting of 16 thrusters in the nose and 28 thrusters in the rear of the orbiter.
Thermal protection for the orbiter during re-entry was provided by a range of hard silica tiles which cover the flat bottom of the orbiter, whilst the nose and wing edges were covered with reinforced carbon.

After re-entry the orbiter glided back to the landing strip, either at Edwards Air Force Base or at the Kennedy Space Centre. The orbiter did not have a propulsion system that permitted maneuvering beyond the use of flaps, during this glide. A landing facility was also built at Vandenberg which was, however, never used, whilst an emergency landing facility at White Sands existed and was used once.

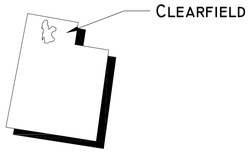
The program initially covered the construction of three test vehicles of the orbiter - MPTA-098, STA-099 and OV-101 - and three space rated orbiters: Columbia (OV-102), Discovery (OV-103) and Atlantis (OV-104). OV-101 became the Space Shuttle Enterprise, which was used in sub-orbital tests and which did not have an orbiting capability but was used in the development of the numerous techniques required for the Space Shuttle, in particular the landing techniques. It had been the intention to convert OV-101 as a space rated orbiter but instead it was found to be more convenient to convert STA-099, which became orbiter Challenger (OV-099) in January 1979. Following the loss of the Challenger a replacement orbiter, known as Endeavour (OV-105), was built.

In the 1990s the remaining orbiters were converted sevreal times to allow longer duration flights as well as integration with the proposed International Space Station.

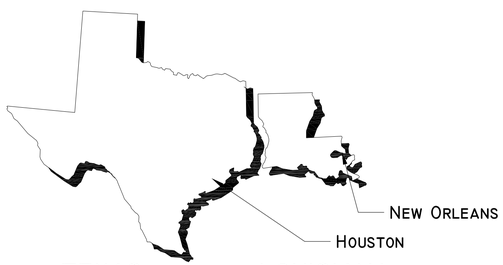
This recording project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering, industrial, and maritime works in the United States. The HAER program is administered by the National Park Service, U.S. Department of the Interior. The Space Transportation System recording project was cosponsored during 2011 by the Space Shuttle Program Transition and Retirement Office of the Johnson Space Center (JSC), with the guidance and assistance of Barbara Severance, Integration Manager, JSC, Jennifer Groman, Federal Preservation Officer, NASA Headquarters and Ralph Allen, Historic Preservation Officer , Marshall Space Flight Center. The field work and measured drawings were prepared under the general direction of Richard O'Connor, Chief, Heritage Documentation Programs, National Park Service. The project was managed by Thomas Behrens, HAER Architect and Project Leader. The Space Transportation System Recording Project consisted architectural delineators, John Wachtel, Iowa State and Joseph Klimek, Illinois Institute of Technology. This documentation is based high-definition laser scans provided by Smart GeoMetrics, Houston, Texas and documentation provided by NASA's Headquarters, Johnson Space Center and Marshall Space Flight Center. Written historical and descriptive data was provided by Archaeological Consultants Inc., Sarasota, Florida. Large-format photographs were produced by NASA's Imaging Lab at Johnson Space Flight Center with supplimental images provided by Jet Lowe, HAER photographer.



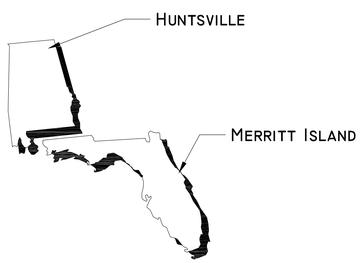
CALIFORNIA



UTAH



TEXAS LOUISIANA



ALABAMA FLORIDA

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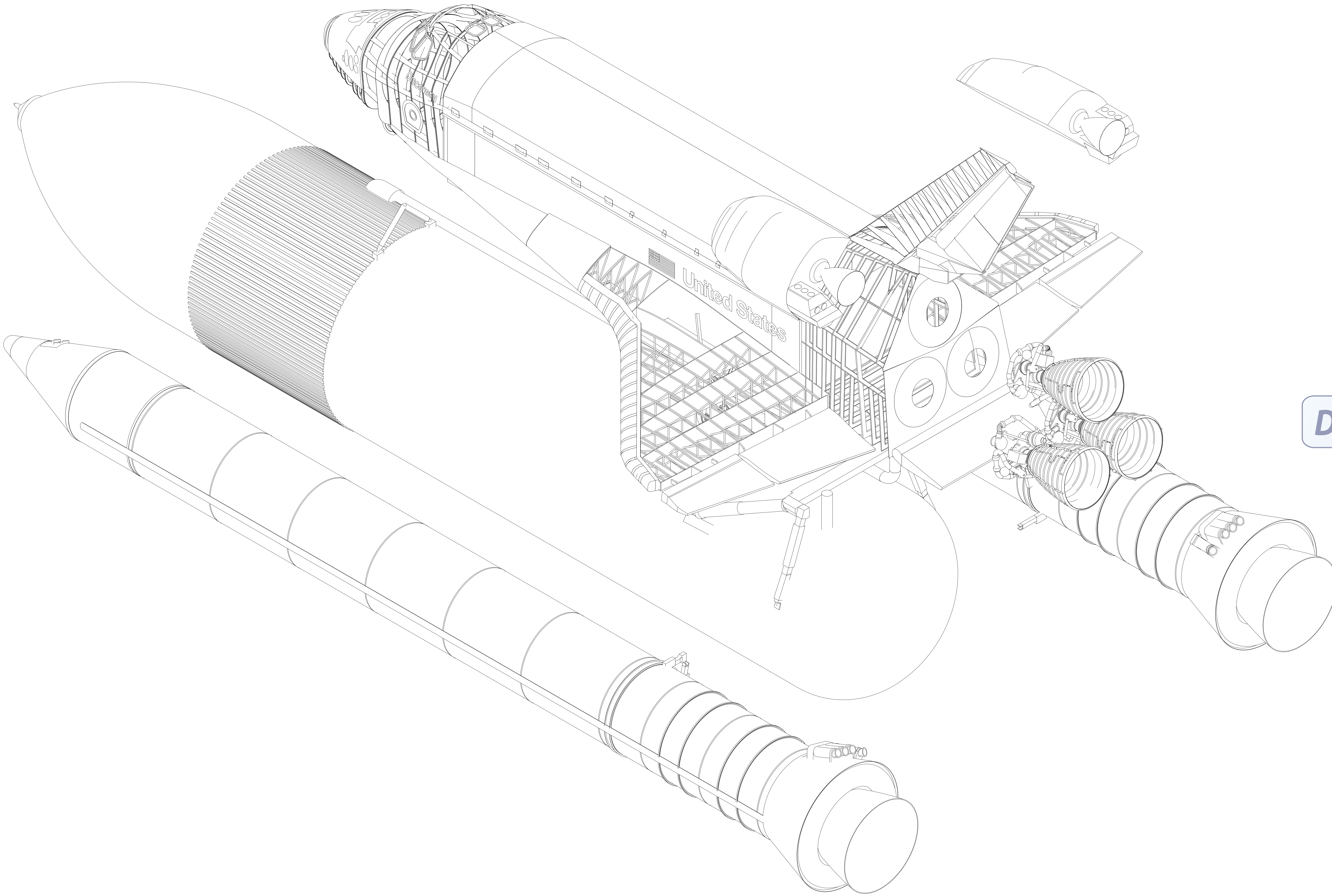

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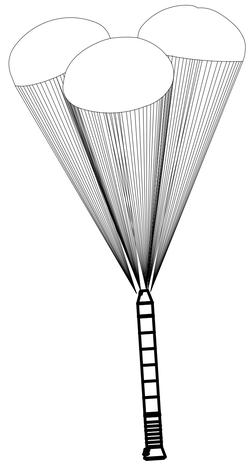
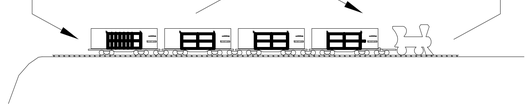


CAPE CANAVERAL
HANGER

JAKALDKJ
KALDJG; LAKGJ; ALKGJ
AKL; GJAKJG;
AGKJA; LKGJ

UTAH REFURBISH CENTER
JAKALDKJ
KALDJG; LAKGJ; ALKGJ
AKL; GJAKJG;
AGKJA; LKGJ



ARF
JAKALDKJ
KALDJG; LAKGJ; ALKGJ
AKL; GJAKJG;
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RPSF
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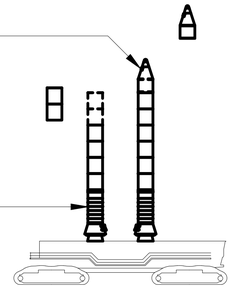
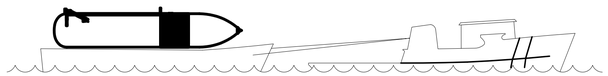
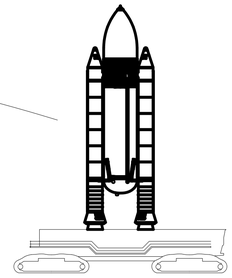
AGKJA; LKGJ



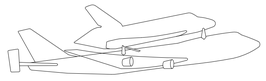
EXTERNAL TANK
REENTRY
DISINTIGRATION

NEW ORLEANS, LA
EXTERNAL TANK MANUFACTURING





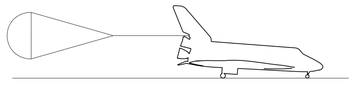
DOWNEY, CA
ORBITER MANUFACTURING



KENNEDY SPACE CENTER, FL
ORBITER PROCESSING FACILITY

KENNEDY SPACE STATION, FLORIDA
HYPERGOLIC MAINTENANCE FACILITY

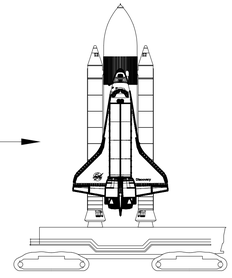
KENNEDY SPACE STATION, FLORIDA
ORBITER PROCESSING FACILITY (OPF)



KENNEDY SPACE CENTER, FLORIDA
SSME PROCESSING FACILITY

CANOGA PARK, CA
SSME FABRICATION

STENNIS SPACE
CENTER, MS
SSME TESTING
FACILITY



TO LAUNCH
PLATFORM FOR
LIFT OFF

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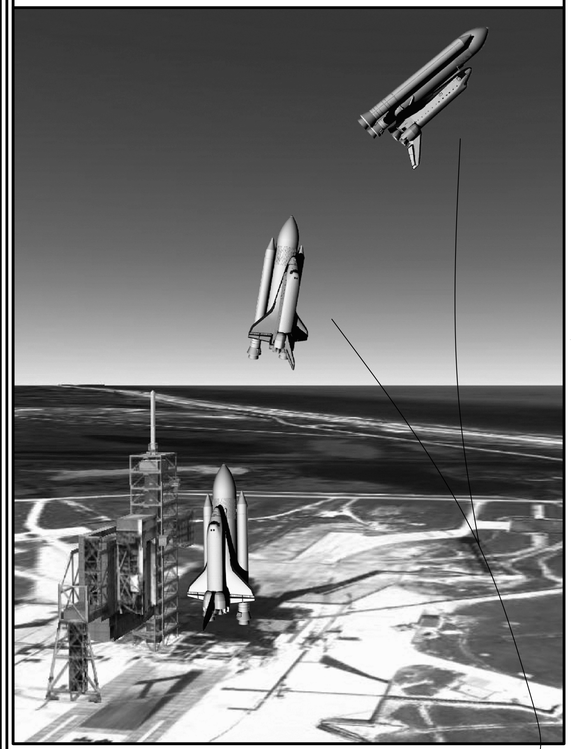
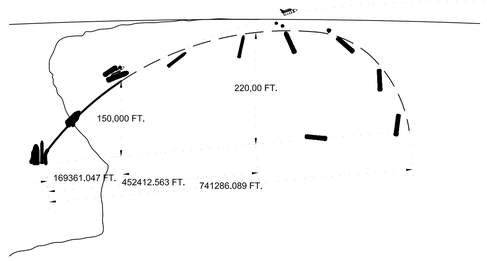
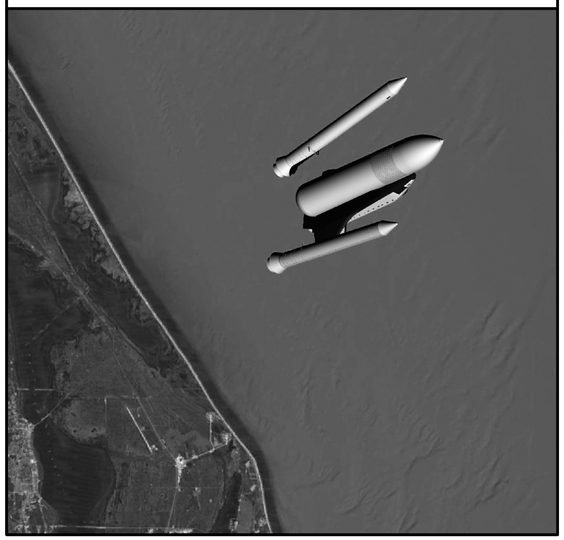
Lift Off
At lift of... Flight Launch Mission Profile TextFlight Launch Mission Profile Text Flight Launch Mission Profile Text

Pitch and Roll
This operation happens immediately after clearing away from the launch platform in order to postion the STS towards it's flight path and orbit entrance angle.

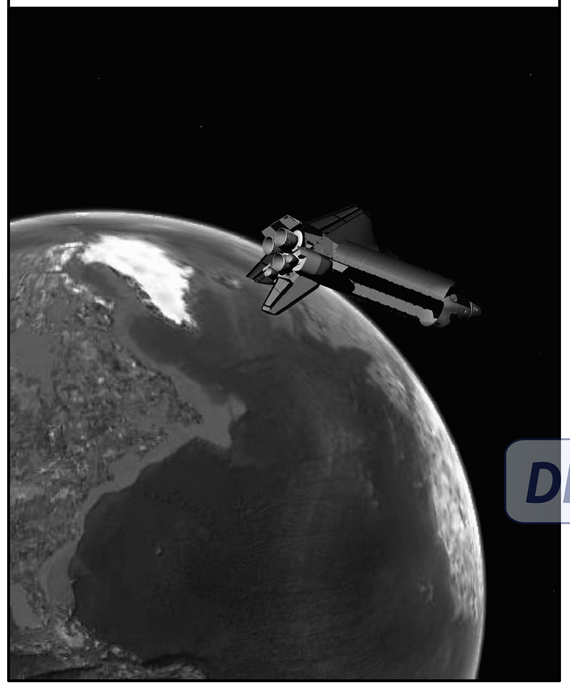


SRB Staging
The SRB's jettison so that they can be retreived upon falling back onto the earth and reused after analyzed and refurbished.





Payload Bay Door Opening
This is for heat relief, kle;lakjg;lkang;lkn lka sng;lakng ;la nkglka ng;la ng;lakn gb;lnka b;la



Ⓐ Launch
T+: 00:00:00

Ⓑ Pitch + Roll
T+: 00:00:11-18

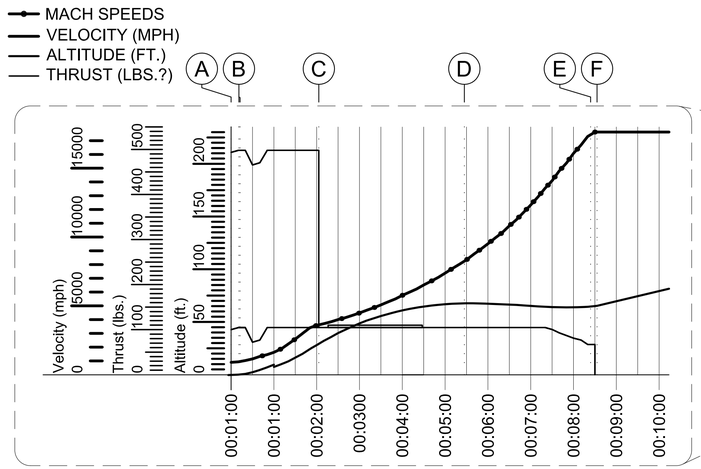
Ⓒ SRB Staging
T+: 00:02:03

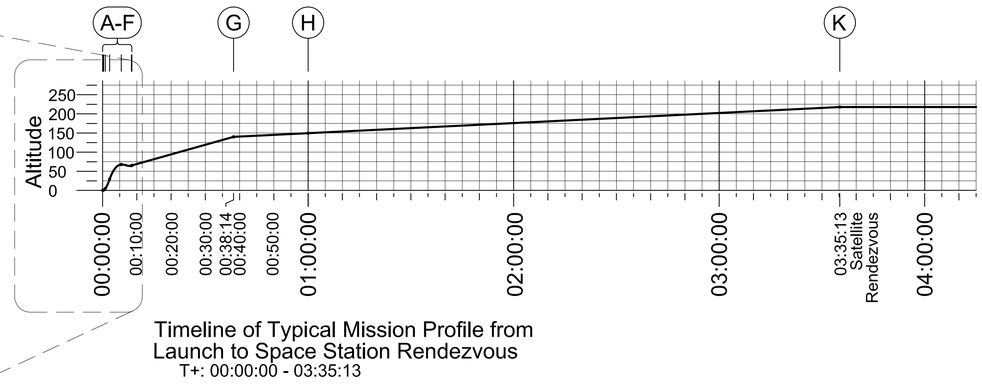
Ⓓ Roll to Heads Up
T+: 00:05:28

Ⓔ+Ⓕ MECO + ET Seperation
T+: 00:08:24 + T+: 00:08:33

Ⓖ Apogee (OMS Burn #2)
T+: 00:38:14

Ⓗ Payload Bay Door Opening
T+: 01:00:00 (?)





Timeline of Typical Mission Profile from Launch to Space Station Rendezvous
T+: 00:00:00 - 03:35:13

Flight Launch Mission Profile

Flight Launch Mission Profile Text Flight Launch Mission Profile Text Flight Launch Mission Profile TextFlight Launch Mission Profile Text Flight Launch Mission Profile Text
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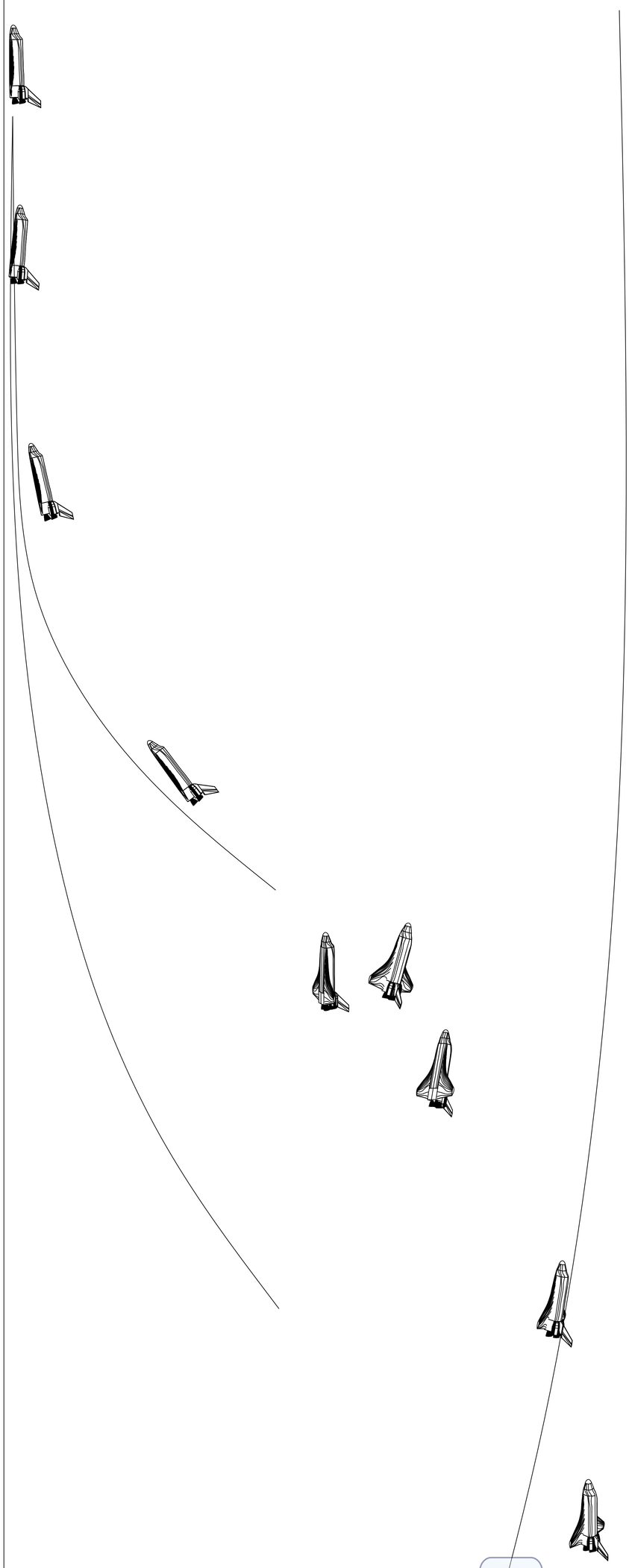

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